“Pervasive Healthcare for Diabetes Patients”

(Diabetes Care)

By

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CERTIFICATE

It is certified that the contents and form of project report entitled **"Pervasive Healthcare for Diabetes Patients"** submitted by **Waqas Qadeer Soomro (2008-NUST-BIT-109), Shoaib Ahmed Qureshi(2008-NUST-BIT-114), Muhammad Waseem Panhwer(2008-NUST-BIT-121)** have been found satisfactory for the requirement of the degree.

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(Mr. Maajid Maqbool)

DEDICATION

This report is dedicated to our parents and teachers who have been a great source of motivation and inspiration and supported us all the way since the beginning of our studies.

Finally, this report is dedicated to all those who love to play positive role for the betterment of human beings.

ACKNOWLEDGEMENTS

First of all we are thankful to Almighty Allah for giving us the strength and ability to complete this challenging project, the prayers of our families also helped us in completing this task so we are also very thankful to them.

We are deeply thankful to our advisor and Co-Advisor, Dr. Hamid Mukhtar and Mr. Maajid Maqbool for helping us throughout the course in accomplishing our final year project. Their guidance, support and motivation enabled us in achieving the objectives of the project.

Table of Contents

ABSTRACT

A problem that is commonly faced by diabetes patients is that they can't portray their information regarding their diet, medication and exercise and they have to go to doctors for their medical checkups and sugar tests and in some cases such clinics are too far away from those areas and the checkup routine is also periodic so the rise and fall in health remains hidden from the doctor. Diabetes patients need customized treatment therefore doctors need to know detailed information about the patients, their diet, exercise and other routine activities. Patients also get bored from the continuous healthcare and with the passage of time their motivation decreases and they start skipping the essential activities which play important role in their health.

This Project focuses on all needs and requirements of both doctors and patients and provides solution of all problems in the form of mobile based application which will let the patients and doctors communicate with each other and will be used for the virtual and continuous treatment and monitoring of diabetic patient.

This Project also consists of some social features to interact with other patients and share experience with each other. This Project also contains the persuasive and motivational features which will help the patients to keep motivated towards healthcare activities. Patients can also compete with each other to get the rank in highest health achiever patients or patient of the week competition and the reminders will also help them in taking medicines, exercises and balanced diet. So after using this application healthcare will become an entertainment activity and part of daily life.

Chapter 1

INTRODUCTION

1.1 Problem Statement

Diabetes is a chronic disease and there is no cure for it so diabetes patients need to take care of their health and daily activities throughout the life, they also need to go to doctors periodically for medical checkups.

In today's world, life has become very fast and people do not have enough time to take care of their health so they cannot regularly go to doctor for their regular checkups due to their busy schedule and especially for diabetic patients it is very difficult to manage and if they do not follow schedule and do not get themselves checked up on time this can be very dangerous for them.

Another problem is that in some of the remote areas hospitals are too far from hometown of patients and it takes a lot of time to reach those places and it wastes a lot of time of those diabetics. As patients are unable to visit the doctor frequently so doctor can't know about the exact situation of patients. Most of the patients are illiterate so their sugar level cannot be measured unless they pay a visit to doctor .The doctor cannot prescribe any new medicines without checkups because of the far and few visits of the patients and he cannot ask patients to change his routine and change existing medicines that patient is using and when doctor does not know about the situation so he cannot judge anything that what to prescribe, what not to prescribe.

When a person is living in any remote area and doctor resides or has clinic in an area which is too far away so in case of emergency the doctor will not be able to handle the situation of the patient and this problem can even endanger the life of a patient and the immediate treatment that doctor might have to give on the basis of statistics like sugar level and blood pressure so when he doesn't have the facts and figures for that he cannot prescribe anything to the patient.

1.2 Solution

There is a severe need of a system that can handle and cater these issues if that system is mobile based then it would be more suitable for the patients because usually they keep mobiles

in their pocket and they have that mobile phone in most of the situation so a mobile based application can help a patient out in handling these issues.

Through this mobile based application doctors can be easily connected with patients and communication would be easier and more effective and there will be no such need of the patient to pay visit to doctor physically and periodically. The doctor will be able to know about activities of patients and their daily diet, sugar level, and daily exercise he takes and on the basis of that information doctor will be able to prescribe some new medicines and exercises to the patient and in this way problem of the for periodic visits will be resolved and the life of patient will become easier.

The doctors will have web based application, they will use the web based application and will be able to monitor their patients using visual reports and prescribe medicines.

The application will let the doctor know about each and every daily activity of the patient including diet, exercise, medicines and his daily glucose level, and other things which he was not able to know from the periodic visits of the doctor.

1.3 Desirable Features

- The communication between the doctor and the patient would become easier.
- Prescription of new medicines would be very easy to the patients and doctor can also ask patients to prevent from certain things in diet and can ask them for certain exercise.
- The application will persuade the patients to take exercise, medicines on time and to have a healthy diet and will create competition between the patients by making ranking of patients on the basis of health progress, they will also get suggestions and appreciations.
- The patient will be able to interact with other patient and this will increase social networking and will help the patients have healthy competition.
- Patients living in remote areas will get rid of tedious long travels for checkups.
- Patients will be motivated towards better healthcare with the help of interesting features of this application.

1.4 Technologies and Tools

The Technologies that are used are

- Android SDK for android application development.
- Eclipse for android application development
- HTML for web portal
- Java Script for web portal
- PHP for web portal
- CSS for web portal
- SQLite for mobile based database
- MySql for server database
- Adobe Photoshop for images and logo designing
- Flash for prototyping
- Dreamweaver for web portal

Chapter 2

LITERATURE REVIEW

We have studied different applications and literature and we will be describing some of the aspects of the applications that are related to our project and those applications will help us in our project.

2.1 Jog Falls

Jog Falls[1] is an application that has been developed by Intel. It has very close resemblance with our application and we are going to add some new feature in our application that lacked in Jog Falls and because of those features as we realize Jog Falls did not gain that success as it could have gained and an important factor that jog falls did not have was the persuasiveness.

Jog Falls has been developed to cater the same problem that we trying to solve through our application it lets the patient to manage and monitor their all daily activities related to their physics and food they daily take and all the goals that are set by physicians are also monitored by the Jog Falls and on the basis of those daily activities the trends are formed and doctor analyzes those trends and on the basis of those trends actionable conclusions are drawn. There is a portal maintained by the application and that portal gives unbiased facts and figures about the daily activities of the patients regarding food he takes and he also sees the progress of the patient towards the goals and evaluates those goals so it was the whole purpose because of which Jog Falls was developed [1].

2.1.1 Objectives of Jog Falls

The requirements of Jog Falls were gathered by working closely with the physicians. This system has been developed to help the patients manage their life style with respect to diet and exercise and it lessens the risk for metabolic syndrome. Following are goals and objectives of the application

The system is to give awareness to patients about calories being created due to food they take and information about expenditure of those calories so it enhances the understanding of the patient that how he can manage and balance the creation and consumption of calories.

The respective physicians must be able to see the information of daily activities of patients like diet ,exercise and medication on weekly and must be able to help and guide user accomplish its goals.

There is supposed to be an automated logging activity in the system to monitor all physical activities of patients and all translation to energy expenditures should be accurate.

It should be assured that system would remain available to the users for 15 hours out of 24 hours because of its excessive usage in normal working hours and the rest should be night time for resting and charging the system.

The System must be capable of tracking record of energy consumption and food taken and when the goals that have been set by the physician are not achieved by the patient and when they are achieved it must notify the users (physicians and patients) in both the cases and it must also keep users informed about the current progress towards meeting goals.

Fig. 1. Jog Falls is a three tier system for diabetes and metabolic syndrome management

2.1.2 System overview of Jog Falls

As the figure shows that Jog Falls functionality has been divided into three tiers we will one by one describe the functionality embedded in each tier

i) Sensing Components

The first tier is all about wearing different sensors on the body which will continuously collect data of body and hence the will have to be continuously attached to the body of the patient. That data will consist of palpitations (heart beat) rate in case we want to analyze calorie consumption currently accelerometers and the sensors based on it are used to measure such kind of data.

ii) Aggregator

The second tier is all about a smart phone which has to be connected with sensors via Bluetooth or anything else so as to aggregate and preserve the data taken from the sensors for the purpose of analyzing the ratio of consumption and intake of calories. Data collected is logged in this layer and data is transmitted to third tier through GPRS.

iii) Backend Application

This third tier is used for storing data collected from the smart phone and storing it to any backend server the data is collected from all the users and shown to physician in the form of any user interface.

The problem in this application is that there is need for the patient to wear sensors, which becomes boring and cumbersome [1].

2.2 On Track Diabetes

This is an application used to deal with diabetes better by tracking the different values like blood glucose, medication exercise and other values such as blood pressure, pulse, food, exercise and weight.

The main attribute of the application is that its interface is very easy to use and it makes it easy to add multiple entries at a time.

Fig: OnTrackDiabetes Patients

The problem of this application is that it is focusing only data record of patient there is no analysis or monitoring of information [2].

2.3 dbees.com - Diabetes log

This application has been created for people like you – having the same disease, each person is different, therefore, the designed solution is fully flexible and adapt to the needs of even the most demanding of diabetics [3].

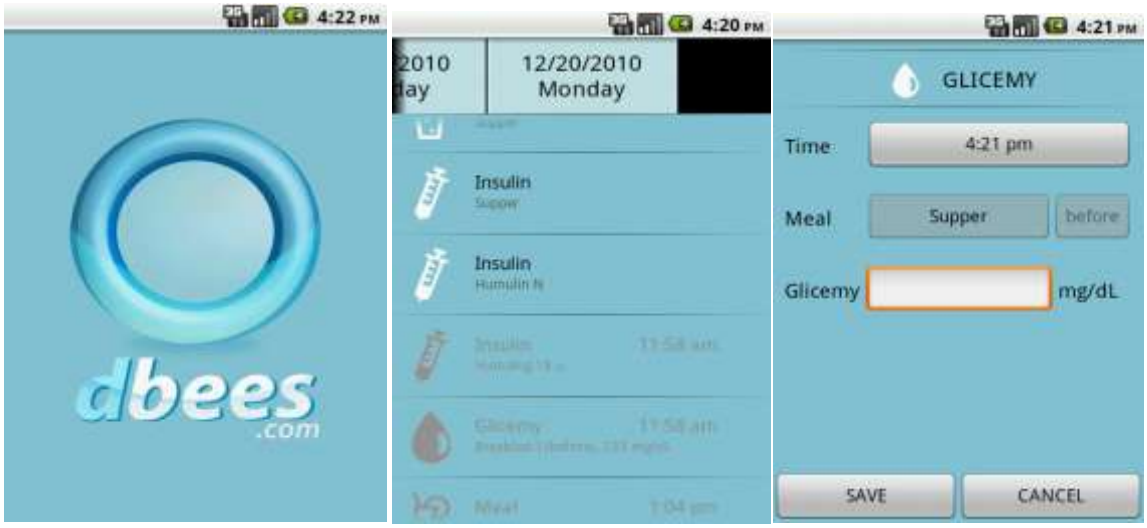


Fig: dbees.com

2.4 Diabetic Management System

Diabetic Management System [4] is a patent-pending mobile app for Android devices to help diabetics eliminate the "calculation guesswork" associated with controlling high and low Blood Sugar levels. It instantly performs "real-time" calculations based on BG Levels, Correction Factors and Insulin to carbohydrates Ratio, and the amount of carbohydrates that are going to be consumed. It utilizes an over 20,000 item (and growing) food search engine to find foods and Diabetic carbohydrates Counts (DCC) in a flash. It also includes a Food Recommendation Engine that provides blood sugar correction items and healthy food choices - all connected to a Health Reporting Engine to help in creating and sending reports to any health practitioner.

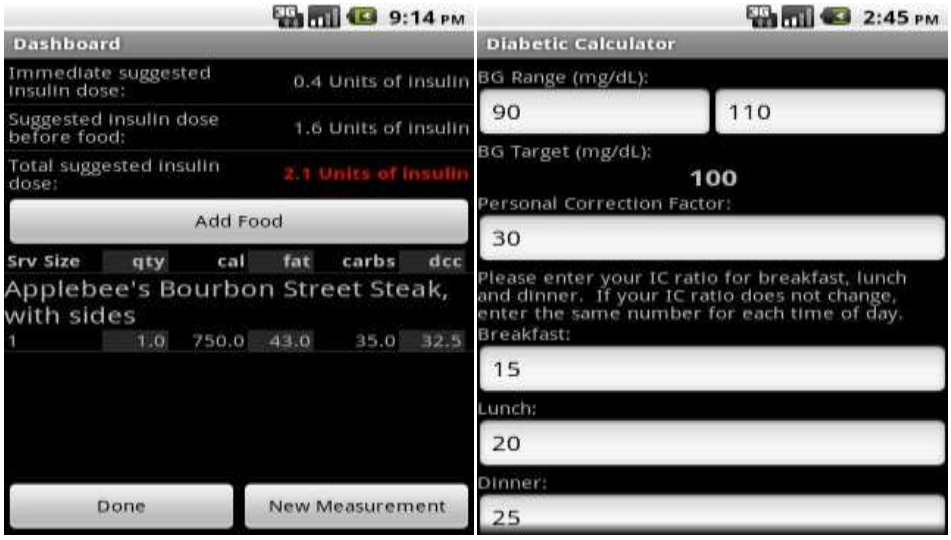


Fig: Diabetic Management system [4]

2.5 PatientsLikeMe

"PatientsLikeMe"[5] is a social networking health website which let's patients to share information, treatment, health status with each other. Patients can find other patients with similar health, age, gender, treatment, symptoms, condition, country and race so that they can share their experience and information with each other to learn about dieses with the help of health reports and graphs. Patients can also discuss on forum to communicate and learn from with each other.

There are so many features in this website which are given as follow:

2.5.1 Profile:

Patient can manage his profile information so that people can find him on social network on the basis of information he has entered in profile.

In profile a patient can enter his picture, date of birth, gender, country, province/state, race, education, about me.

There is also advanced information in the profile which is asked from the patient in the form of questionnaires or forms.

- **Quality of Life:** Questionnaire related to physical, mental and social condition of patient to analyze patient.
- **Mood Map:** questionnaire related to mood and feelings of person to analyze his nature.
- **My Treatments:** List and date of all treatments taken by patient.
- **My Symptoms:** Symptoms of patient for example Anxious Mood, Depressed Mood, Fatigue, Insomnia or Pain.
- **Weight**: Weight of patient.

2.5.2 Patients:

A Patient can find other patients like him. Search is based on the different filtering criteria for example a patient can search patient on the basis of age, gender, stars, treatment, symptoms, conditions and some other options.

2.5.3 Forum:

In forum a patient can see discussions related to his conditions for example a patient will see the list of all discussions carried by similar type of patients and he can also participate in those discussions

2.5.4 Treatments:

In "treatment" patient can add his treatments and can also see list of all the treatments and statistics of patients who are taking treatment.

For example

Treatment	Patients	percentage
Individual Therapy	751	16%
Lorazepam	264	5%
Paroxetine	108	2%

2.5.5 Symptoms:

There are different types of symptoms for different patients, For example:

- Anticipatory anxiety
- Anxious mood
- Avoidance of situations
- Depressed mood
- Fatigue
- Fear of embarrassment
- Insomnia
- Pain
- Panic attacks

All "*PatientsLikeMe"* members start with five symptoms: Anxious Mood, Depressed Mood, Fatigue, Insomnia, and Pain. They are good indicators of your health. It may also ask you about additional symptoms related to your condition. If you do not have some (or any) of these symptoms, you can remove them at any time. Once you have saved a symptom survey, you can choose which other symptoms you would like to add on your profile.

Fig: PatientsLikeMe [5]

Chapter 3

METHODOLOGY AND WORK PLAN

3.1 Project objectives

Creating an application which can help diabetes patients in their health care and which can persuade them to take exercise and have medicines on time through reminders of application. Through social feature patients can interact with each other, can continuously monitor their activities and can let doctor know about each of their activity. We are trying to create an intelligent system to help them in their health care activities without their effort and making their life easier by improving the communication between doctor and patient. Doctor can easily monitor the activities of patients and he can see the generated graphs and reports of the monthly or weekly activities and on the basis of that he can suggest some medicines to him, there will be a complete monitoring of each activity including food, medicine, exercise and glucose that which activity patient performs at a particular time and on the basis of that data some persuasive techniques will be used to help him to achieve his goal. Social features of the application is a major part of this application in which persuasive techniques are used and a profile will be maintained by each patient that other patients can see so it will be like a community of all the diabetes patients.

3.2 Approach followed

The approach that has been followed by us is "divide and conquer". We divided the whole project into modules and each member worked on a separate module and after that while completing each module we kept on integrating each module of the project besides that each group member helped each other in the project and module whenever some problem occurred. The technologies/tools that we have used in our projects include

- Used SQLite for storing the database of android and retrieving it.
- Simple Android programming for business logic
- XML for creating android application interface
- Used Adobe Photoshop for designing logos and icons
- Eclipse IDE for android programming
- PHP for Web portal

3.3 Challenges Encountered

Biggest challenge for us was collection of data related to diabetes because we were unaware of the calories information of each food item and what food item usually are more taken by the diabetes patients.

Usage of persuasive technique was one more issue for us because we had not practically done that before so it was a bit issue for us that what techniques should be used and , where should be used and how they should be used.

Usability of an interface is really important and for the sake of achieving a usable interface we had to make several changes in our interface so it took a lot of time.

There were several changes in our scope so there occurred a scope creep in our project due to increased scope but we successfully controlled it by having a negotiation with our stakeholders.

Several changes in interfaces also created trouble for us by taking too much time.

There were certain database connectivity issues that we had to face while working on our project.

Integration of all the modules was also an issue for us because integration management is a very difficult task.

3.4 Modules of project

Here is technical detail about modules of project.

3.4.1 Database Design

Database of our application and web portal is given below.

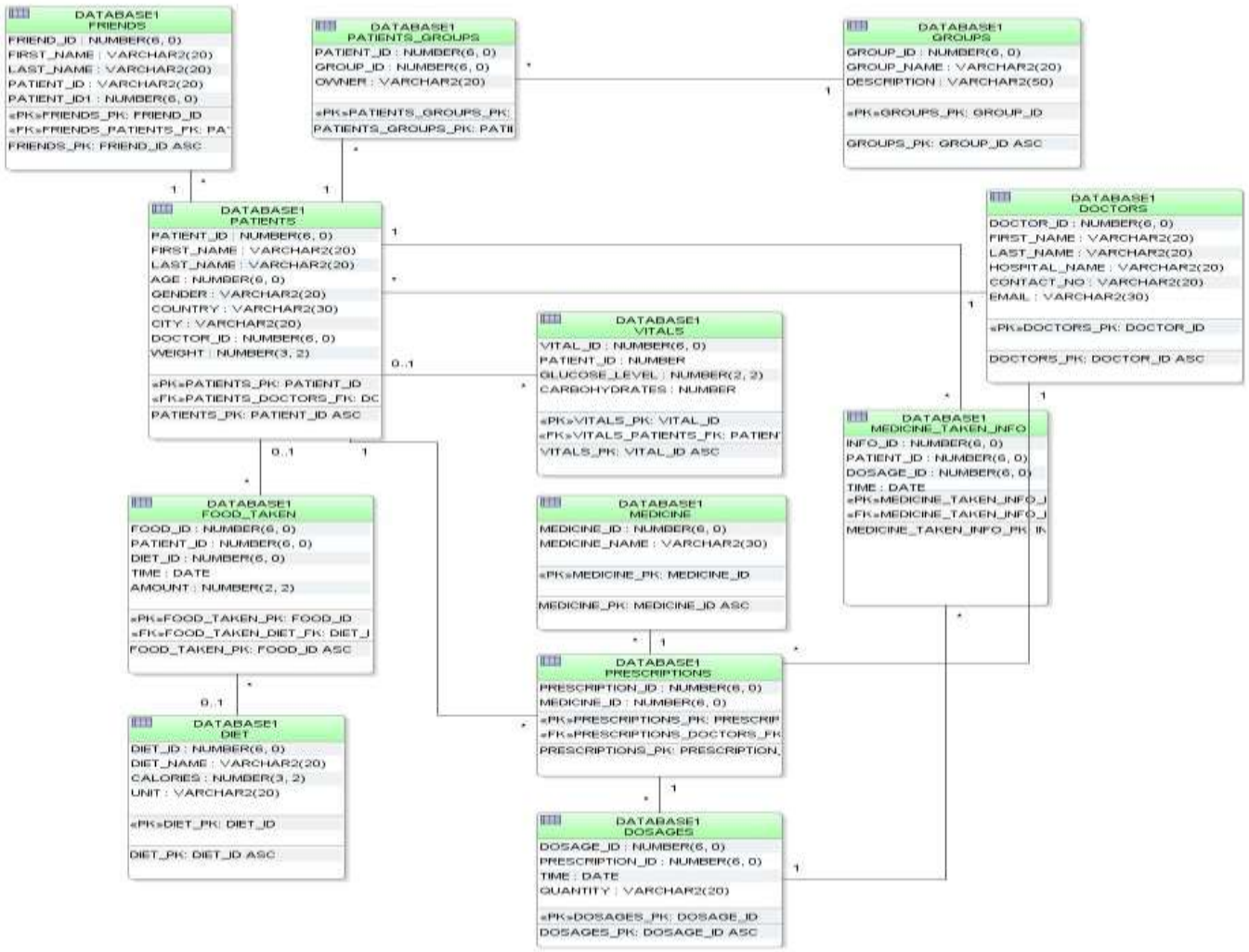


Fig: ERD of database

3.4.2 Profile

Profile of a patient contains different types of information for example basic information (name, gender, age, city etc) and medical information (diabetes type, weight, date of diagnosis etc). This is a onetime process which is required initially at the time of profile creating.

There are different profiles like personal profile, medical profile, and social profile. Social profile plays important role in persuasive techniques.

A user's social profile is constructed from his interaction with other persons in his social network and his other activities. Profile is also important to interact with each other and to know each other, for example a user can view his own profile as well as other's profile. He can also find other users based on profile information and some other criteria.

Social Profile will be implemented along with social networking module where as personal profile and medical profile has been implemented and in these profiles user can view his basic information as well as medical information, user can also update his basic information or medical information.

Fig: (a) Interface to view profile (b) Interface to edit basic info

3.4.3Medication

This part of application contains complete information about the medication of patient including notification when it is the time of medicine and user have not either entered the information or have not taken the medicine so it reminds user of the medicine you are to take and if user wants to use that medication on that time it takes him to that medication activity, where list of prescribed medicines by doctor appears and user clicks the check box for the medicines user has taken and then he submits that whole information. Besides medicines this part also covers the glucose monitoring in which patients enter their glucose about six times a day and which can also be monitored by the patients and they can see what glucose level has been throughout the day.

Medicine part of the application also contains 3 type of medicines dosages on the basis of time morning, evening and night and patient can itself see what medicines he has taken and what medicines he has not taken so it reminds him of the medicines he is to take and he has not taken

so all this is confined in monitoring part of the medicines so that patient can monitor himself/herself.

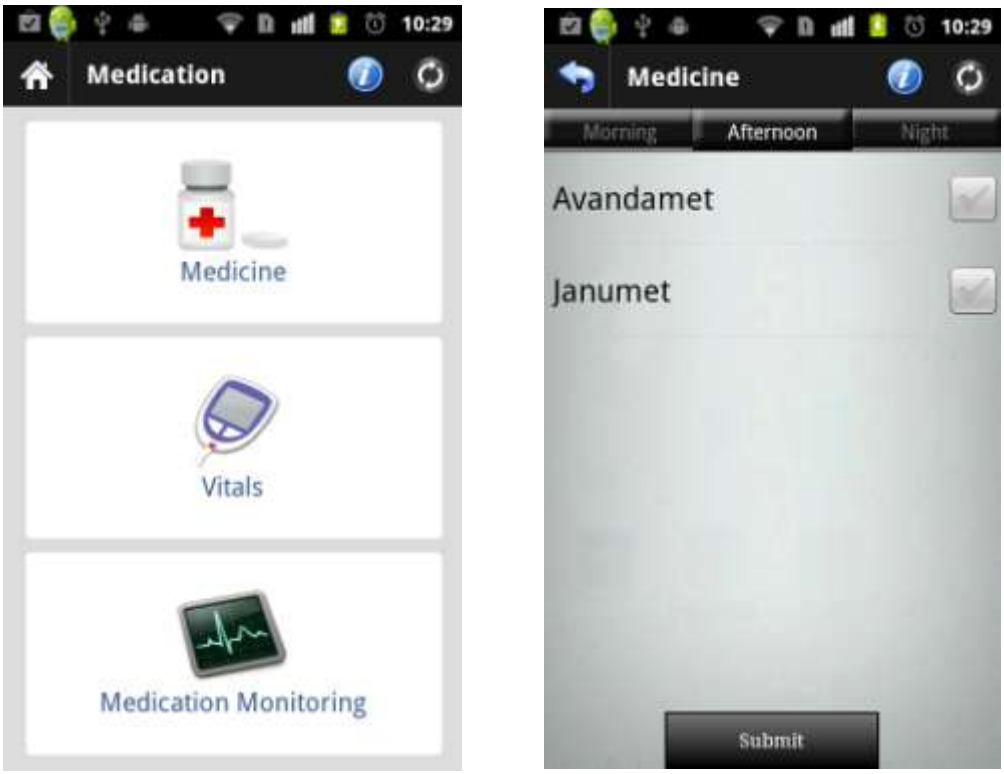


Fig: Interface of medicine feature which let's user insert taken medicines.

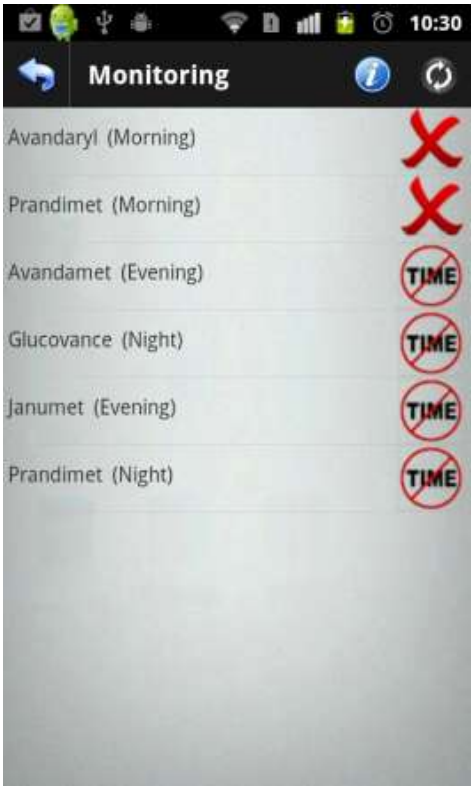


Fig (i): Interface of monitoring-medicine list

Fig(ii): Interface to insert glucose level for particular period

3.4.4 Diet

Our Diet Module helps diabetes patients and acts as a Meal planner for diabetes patients through our application diabetes patients can enter their breakfast, lunch, dinner and extra food item which diabetes patients eat in whole day our application also monitors each daily food activity if diabetes patients take more food than required calories our application monitoring phase gives some good suggestions to user to burn these calories or suggests user that you are not allowed to take further food in a day also our application monitoring phase shows some pictures to user to motivate or suggest him and our application is the best solution for diabetes patients because we did a survey on diabetes patients and we got all the data which will help diabetes patient to control their sugar in easily. Calories of all food items are calculated on the basis information given by DrAsif.com [6] and American Dietary Guidelinef .

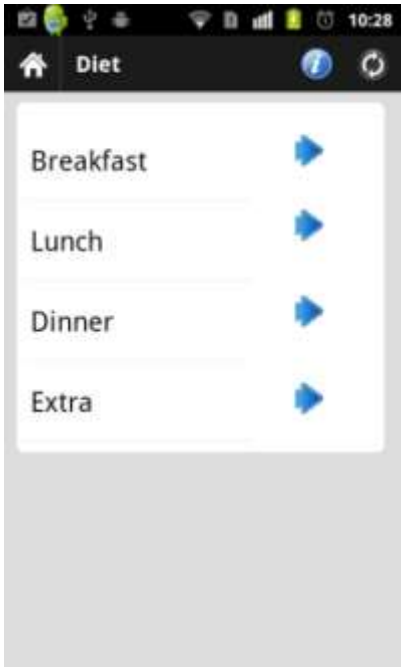


Fig: Interface of Diet feature

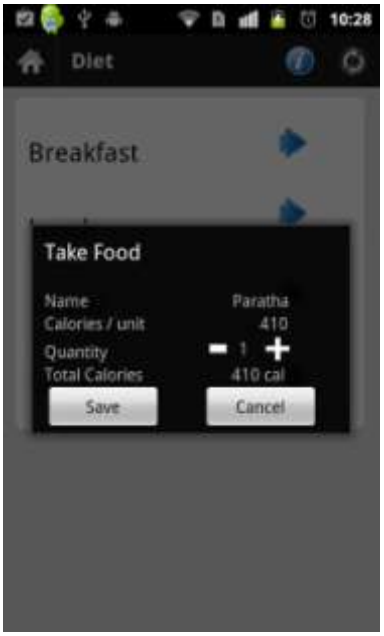


Fig: this figures shows Lunch menu to select food and Pop-up to select amount along with calories calculation

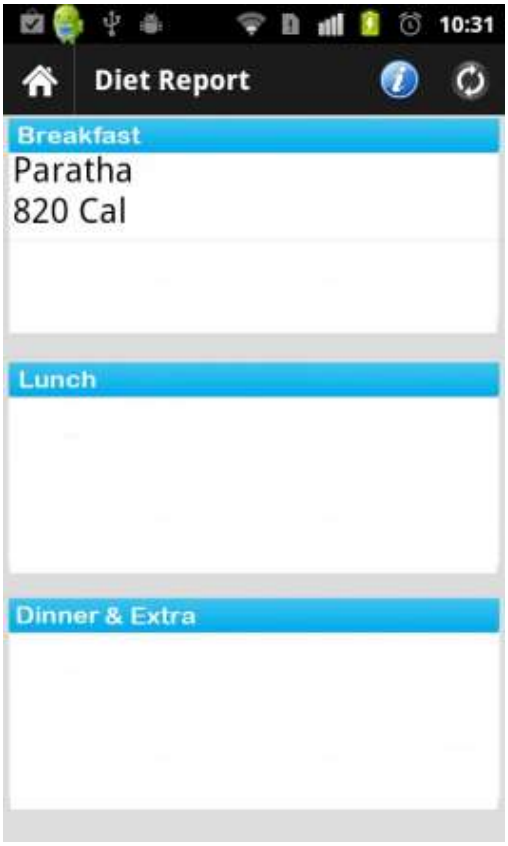


Fig: this figure shows the diet monitoring activity

3.4.4 Exercise

Exercise is a very important module which is used to record the daily exercises done by patients and it also records the type of exercise and also the duration of exercise and according to which it calculates the calories burnt [7] [8] by the patient and in the monitoring part the exercise taken and calories burnt are shown and patients can monitor themselves through these activities and can know how much calories have they burnt [9].

Amount of calories which need to be burnt depends upon the activeness, BMI [10], and other characteristics of patients.


10:30
Exercise
Indoor Exercise
Outdoor Exercise
Gym Exercise
Sports


10:30
Indoor Exercise
Calf Exercises
Walking Inside
Waist Bends
Knee Bends
Stretching
Jumping Jacks


10:30
Exercise
DBCARE
Calf Exercise
Exercise Duration in Minutes
Exercise Level
Easy
Save
Help
Cancel
Gym Exercise
Sports

3.4.4 Social

This module is aimed at interaction between doctors and patients as well as between the patients can share their experience with each other and they can send messages to each other and they can invite each other for a particular event and a whole community of patients is formed and this removes cumbersome and boredom from the health maintaining activities and on the basis of activities followed by the patients rank of the patient gets generated and this way a healthy competition is there in between the patients that persuades patients to take exercise ,healthy diet and medication on time patients can send messages and can communicate with each other this way they can also see their friend list they can search anyone they can send request to any one they desire to send request to any one and the request receiver can receive the request.


10:31
Your Rank
Your Rank
Waseem 800 pts
Adeel 750 pts
Shoaib 600 pts
Nasir 500 pts
Waqas 350 pts
Saeed 200 pts

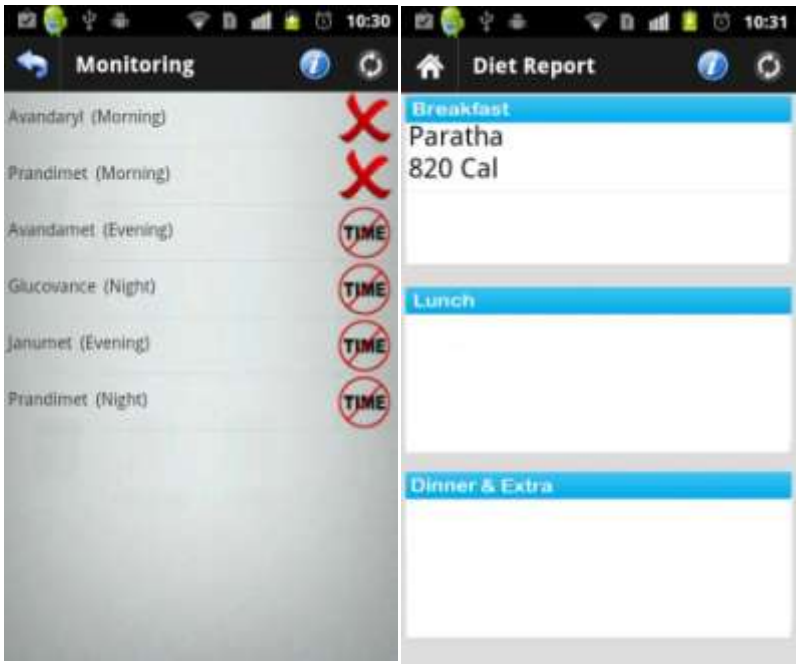

10:31
Event Invitation
Event Invitation
Title
Description
Location
Create


10:32
Event Invitation
Event Invitation
Orgnized by Event Title Event Location
Waseem FYP 8June
Waqas Tedx Marroitt
Waqas Tedx Karachi
Waqas Tedx SMME
Waqas Tedx ali
Waqas Tedx SEECS


10:32
Messages
Messages
Waseem FYP Java Docs

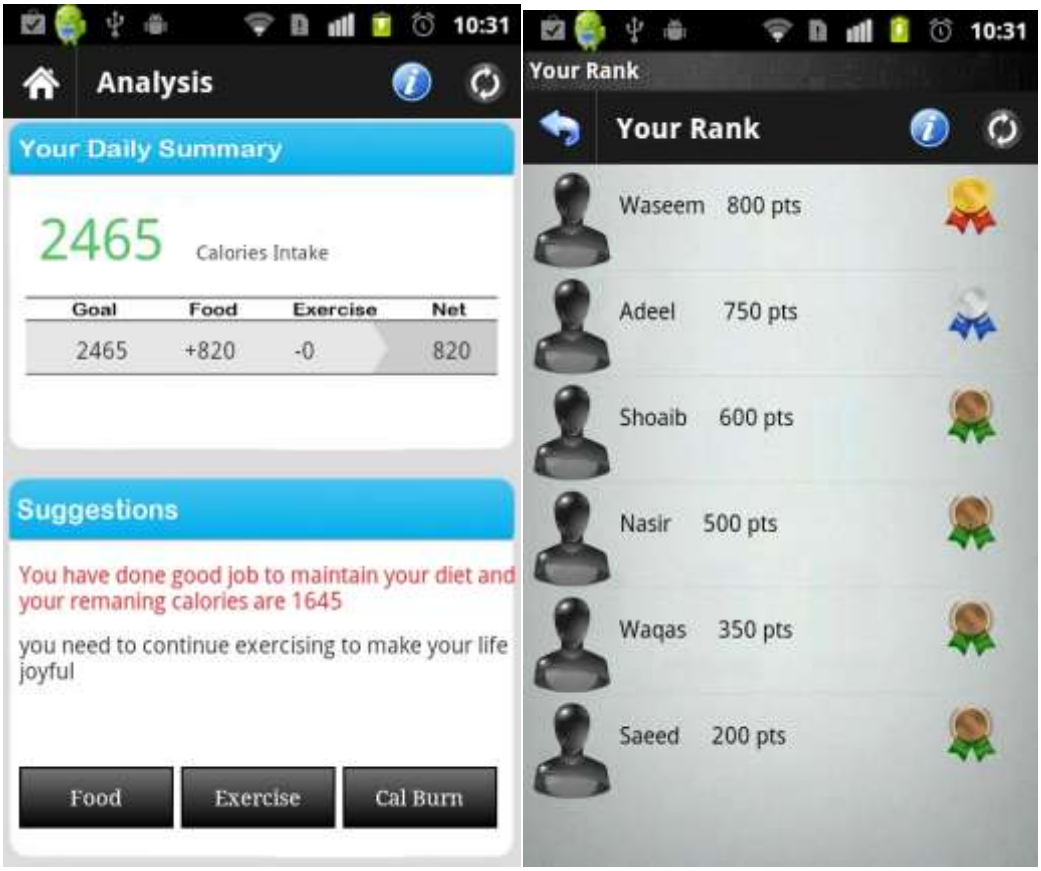
3.4.5Analysis

There is a important feature of this application which is analysis and in which patients can see the data of their daily activity and figure out where they are lacking and where they are good enough and due to this analysis part there is a self-realization that arises in patients about the activities they are not good enough in and they try to improve those activities and there is an analysis activity on the doctor side as well where doctor can see calories burnt against calories gained of a patient and patient can himself also monitor those activities which will help them in the process of self-realization so that they may see their activities.



3.5 Persuasion

This application persuades a diabetic patients to take healthy diet, exercises, medication by giving them system generated suggestions and reminders by the android application and through the social feature of the application he can see other patients activities and once he knows some other patient's success story he gets motivated to do the same and there is a patient of the day activity to appreciate the patient so that he gets motivated and does better next time too and also top 10 patient list is generated and patient can know his score too so maintaining the health becomes a game for the patient.



List of persuasive techniques:

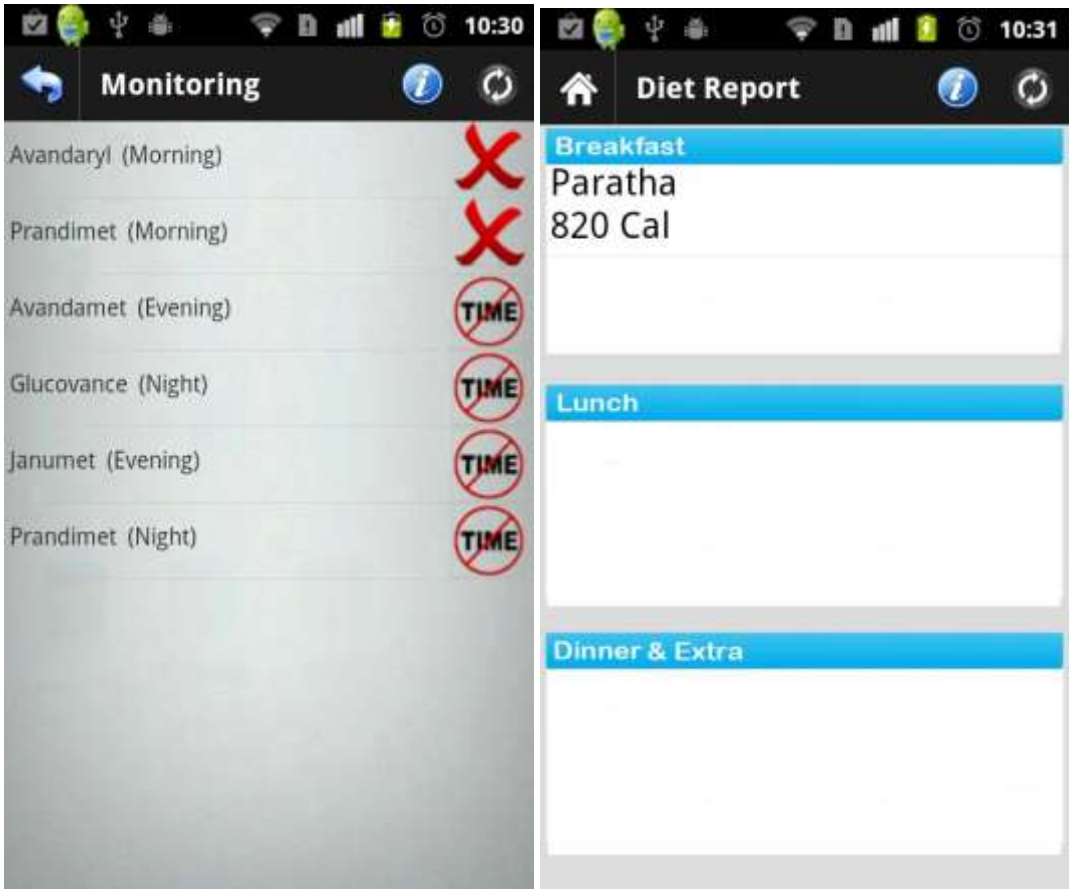
- Competition among patients
- Ranks
- Influence from community
- Widget on the main screen to get attention towards health condition
- Suggestions for awareness about health condition
- Appreciations for following healthcare activities
- Reminders to remind the medicine timings
- Analysis for self realization

Chapter 4

RESULTS

4.1 Better self-monitoring

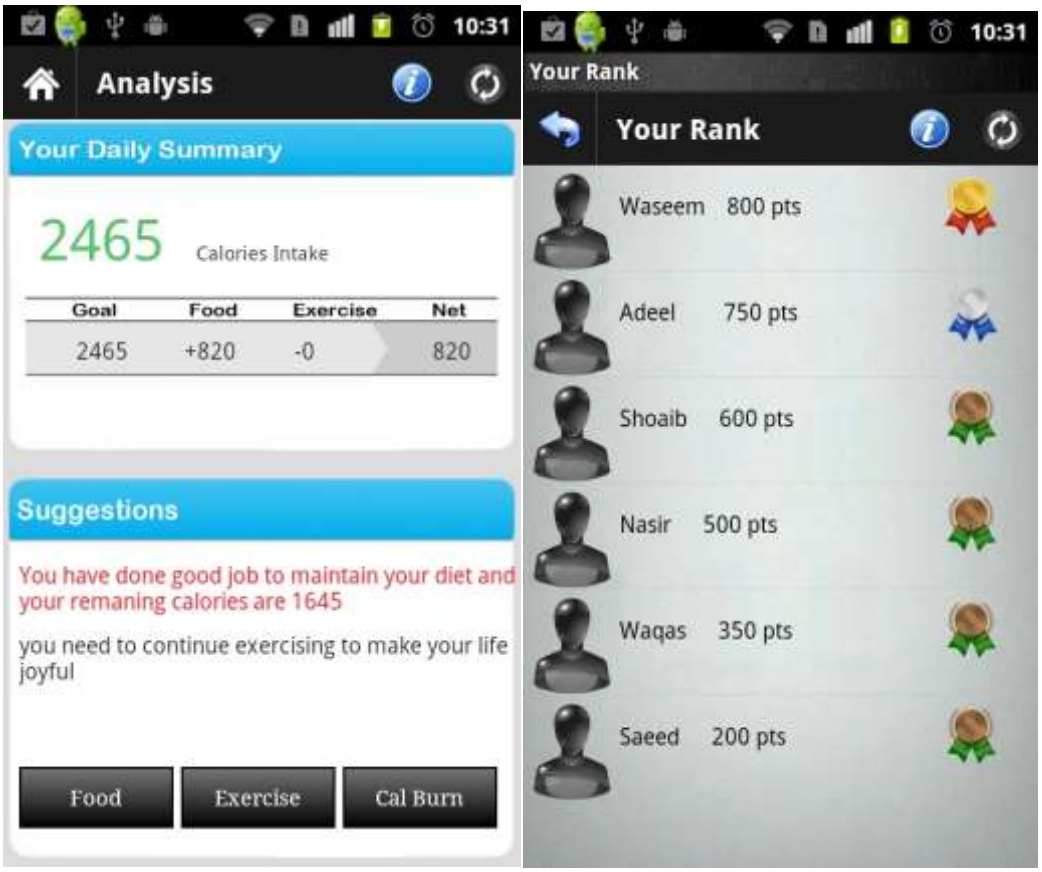
This application has a very unique feature of self-monitoring that patients can monitor himself that whatever he eats and whatever medicines he takes and the exercises he takes and that all information is recorded in database and patients can view that information and can see and know what medicines he has taken and what medicines he was supposed to take that he did not take and he can see what food did he take and how much calories did he gain and how much calories did he require to meet his goal and how much calories did he actually gain so that he can be conscious about his diet and so that he can be motivated to take some exercises to burn the calories gained by overeating so that he can remain healthy.



Both of these images show self-monitoring screen where a patient can monitor himself and his activities that he performs daily that what medicines he has taken and what he has not and what food did he take today and how much calories did that food contain.

4.2 Persuasion to achieve goals

This application persuades a diabetic patients to take healthy diet, exercises, medication by giving them system generated suggestions and reminders by the android application and through the social feature of the application he can see other patients activities and once he knows some other patient's success story he gets motivated to do the same and there is a patient of the day activity to appreciate the patient so that he gets motivated and does better next time too and also top 10 patient list is generated and patient can know his score too so maintaining the health becomes a game for the patient.



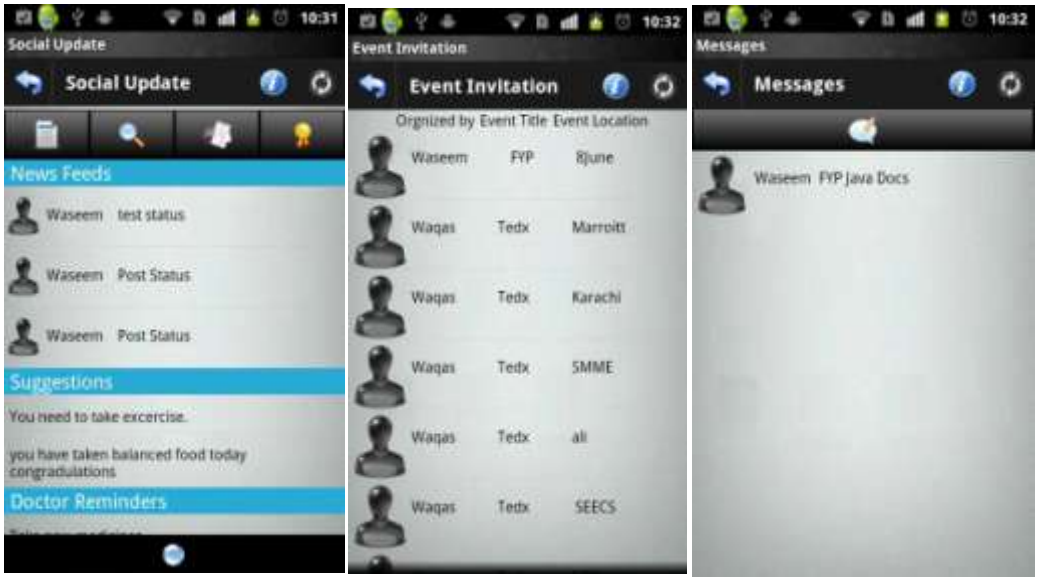
Both of these images show the persuasion being used in the system in the first screen there is a goal of calories given to patient and system generated suggestions are being given to patient and in the other screen patients can see their ranking on the basis of their activities and if they are doing good they can secure good points and can get a good rank.

4.3 Better monitoring from doctor side

Doctors are usually unable to monitor the activities of patients because the visits of the patients are periodic so the doctor was unable to know the activities that he performed in between that time so now doctor knows those activities and he can better suggest medicines and exercises to patients so that they can do better.

4.4 Interaction among patients

By using this application a whole community of patients has been formed where patients can message each other they can know each other's activity they can talk to each other and they can be motivated by each other's activity and even they can invite each other for the exercise and they can be there with them this way a group of patients will be there for exercise and it will not boring anymore and patients will enjoy doing exercises.



These screens show interaction between all the patients in the first screen show experience sharing among the patients that they can share their experience with each other and in the second screen they can see each other's invitation and in the third screen they can send messages to each other and see each other's messages.

4.5 Better interaction between doctor and patient

This application has narrowed down the communication gap between doctor and patients and now doctors can communicate properly with the patients he can give better suggestion on the basis of statistics generated from patient's data and he is able to prescribe them proper medicines, exercises. Doctor's suggestion will appear in news feed as well that will persuade patients to follow the suggestion of doctor patient can ask queries and doctor can reply those queries and he is in a better position to suggest things because he has the data of patients.

Chapter 5

DISCUSSION

This application contains the persuasive techniques to persuade the patients to keep maintaining their health, because diabetes has no cure but it can be balanced by taking proper healthcare and according to human psyche person is interested towards better healthcare but with the passage of time this interest is going to decrease.

Following are few techniques used in the application to persuade the patient:

Suggestions:

This application generates suggestion on the basis of user behavior and his/her activities. User will get suggested for every kind of situation.

Appraisals:

There is appreciation when user follows all the activities for example if patients take medicine on time, maintains calories need and follow exercise as per need then he/she is appreciated.

Motivations:

If user does not follow any activity then he is motivated to take follow the activities for better health.

Reminders:

User get's reminded for medicines with the help of notifications, alerts and suggestions so that use can take medicine on time and do not miss any medicine.

Self-realization through monitoring:

There is monitoring feature in application in which patient can monitor his daily activities and can realize that what he is following and what he missed.

Ranks:

There is ranking system among patients so if a patient is following any healthcare activity then he will earn points in against that activity, in this way the patient who is following all activities will get more points.
For categorization there are three kinds of badges: gold, silver, and bronze

Experience sharing:

Patients can share any status or experience related to any health activity so that other patients can also know about it, this feature can persuade patients to follow the healthcare activities by inspiring the experience of any other patient.

GPS tracking (exercise as an entertainment):

GPS Tracking feature is included to in application to make the exercise activity more interesting and easy for patients to follow, through this feature they can know that how much calories have they burnt during any walking/running exercise , what distance have they covered and what is the average speed of their walking/running activity.

Chapter 6

CONCLUSION

This application was developed keeping in mind the problems of diabetic patients in daily life. It focuses on all aspects of diabetes patients to improve the health of diabetic patients and to make life easy. The fundamental focus of this application is on medication, diet, exercise, suggestions based on user behavior, persuasion, reminders, monitoring and analysis. This Application also focuses on ease of healthcare and to make healthcare an entertainment activity. There is GPS tracker module in application which is integrated with exercise so that user can perform walking or jogging activity along with monitoring of activities burnt during that activity.

This application also provides a platform to all diabetic patients to connect with each other for experience sharing, interacting with each other and competing with others for getting good ranks on the basis of healthcare activities.

This application combines all the features which a diabetic patient needs in daily life and it makes the life of diabetic patients easier and joyful

Chapter 7

RECOMMENDATIONS

In the application different formulas and algorithms are used to calculate daily calories need of a person and the variables used in these formulas are age, weight, gender, height, activity factor.

In future there can be some more features and more artificial intelligence can be applied which will help the patient to know which food and how much quantity of that food should he/she take.

Instead of focusing daily calories need of a patient, it can be more specific to calories need per serving. For example if daily calories need of a person is "2600 calories" then it can be further divided on the basis of each serving. (e.g. breakfast=700 calories, lunch=900 calories, dinner=800 calories etc..). It will need a lot of research and background study of energy need of human body. The food or exercise will be suggested on the basis of calories need, and preferences of the patient.

This application can be integrated with "Facebook" or "Twitter" to share user experience on these social networking websites.

GPS tracking module can be extended with other features. For example: User can see patients with the help of GPS and they can know who are currently taking exercise, walking or doing any other outdoor exercise so that he/she can accompany that patient.

The doctor may record instruction in voice if possible and then the patient may listen to that instruction to follow doctors advice or it may be translated by thrid volunteer person who know both native and english language.

REFERENCES

[1] Jog Falls: A Pervasive Healthcare Platform for Diabetes Management
Lama Nachman, AmitBaxi, Sangeeta Bhattacharya, VivekDarera, Piyush, Deshpande, NagarajuKodalapura, Vincent Mageshkumar, SatishRath, Junaith, Shahabdeen, RavirajaAcharya

[2] On Track Diabetes
https://play.google.com/store/apps/details?id=com.gexperts.ontrack&hl=en

[3] dbees.com https://play.google.com/store/apps/details?id=com.freshware.dbees

[4] Diabetic Management System
https://play.google.com/store/apps/details?id=com.mentormate.diabeticcalc&hl=en

[5] PatientsLikeMe http://www.patientslikeme.com

[6] Diet related calories estimate http://www.dr.asif.com

[7] Calories consumption http://calorielab.com/burned

[8] Calories burned during exercise
http://www.exercise4weightloss.com/calories-burned-during-exercise.html

[9] Physical Activity Guidelines for Americans 2008
http://walking.about.com/od/beginners/a/guidelines2008.htm

[10] Weight loss
http://walking.about.com/od/weightloss/u/weightloss.htm

List of useful resources used in the project:

- Be your own dietician.pdf
- Basic Eating Guidelines.pdf
- Calculating BMI and Estimated Energy Requirements (EER).pdf
- Calorie Need Estimates.pdf
- Calories Burned During Specific Exercises (Average).pdf
- Calorie Need Estimates.pdf
- calchart.pdf
- Dietary Guidelines for Americans 2010.pdf
- Diabetes-You Can Eat everything.pdf
- Exercise and Weight Control.pdf
- General Physical Activities Defined by Level of Intensity.pdf
- Framework for Socially-Interactive Persuasion for Healthcare Self-Management
  Hamid Mukhtar, Mohsin Abbas, Amir Hayat, Arshad Ali, ungyoung Lee